











### 4.3 Peak Power Excursion Measurement [Section 15.407(a)(6) ]

#### 4.3.1 Test Procedure

1. The Transmitter output of EUT was connected to the spectrum analyzer.
2. Frequency SPAN of Spectrum: 30MHz or 50MHz.
3. Trace 1 : RBW: 1MHz, VBW: 3MHz. Using positive detector and Max -hold
4. Trace 2 : RBW: 1MHz, VBW: 3MHz. Using Sample detector and Max-hold
5. Record the largest difference between Trace 1 and Trace 2.

#### 4.3.2 Test Setup



#### 4.3.3 Test Data: (Normal Mode)

##### Peak Power Excursion

Temp. (deg. C): 25

Test Engr: Mailes Hsieh

Humidity (%): 50

| Channel | Frequency (Mhz) | Peak Power Excursion (dBm) | Limit dBm | Pass/Fail |
|---------|-----------------|----------------------------|-----------|-----------|
| 1       | 5180            | 11.98                      | 13        | Pass      |
| 4       | 5240            | 11.73                      | 13        | Pass      |
| 5       | 5260            | 11.70                      | 13        | Pass      |
| 8       | 5320            | 12.05                      | 13        | Pass      |
| 9       | 5745            | 12.23                      | 13        | Pass      |
| 12      | 5805            | 11.04                      | 13        | Pass      |

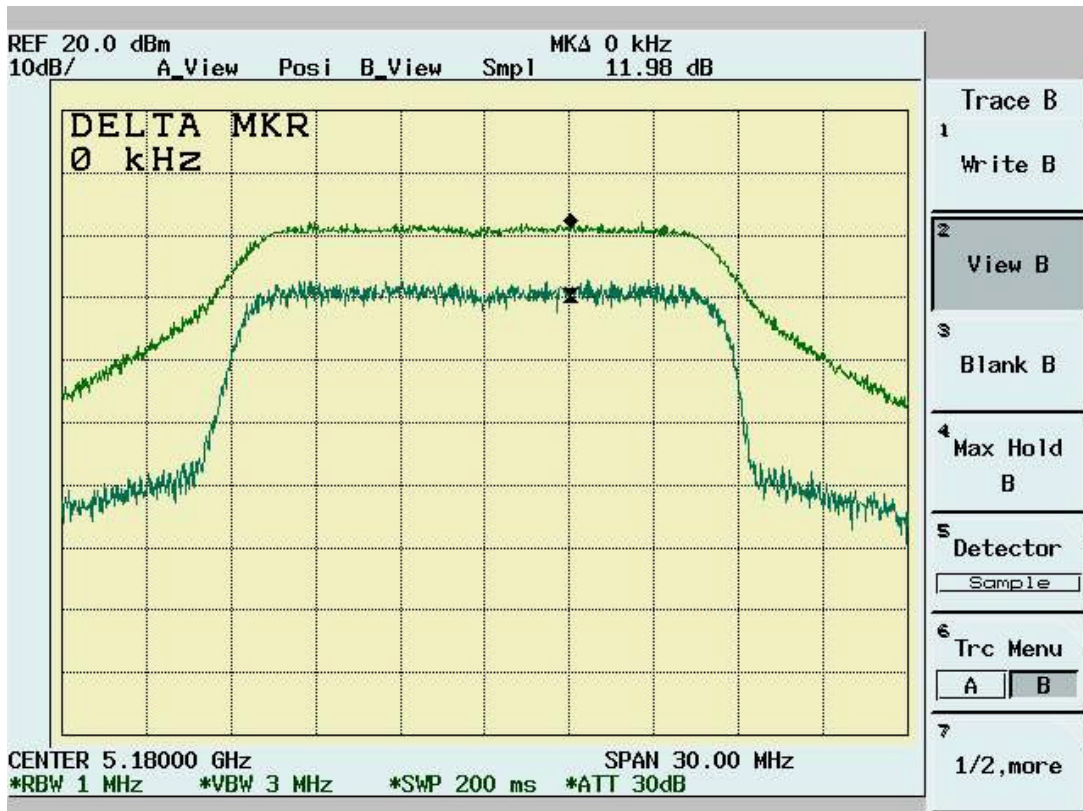
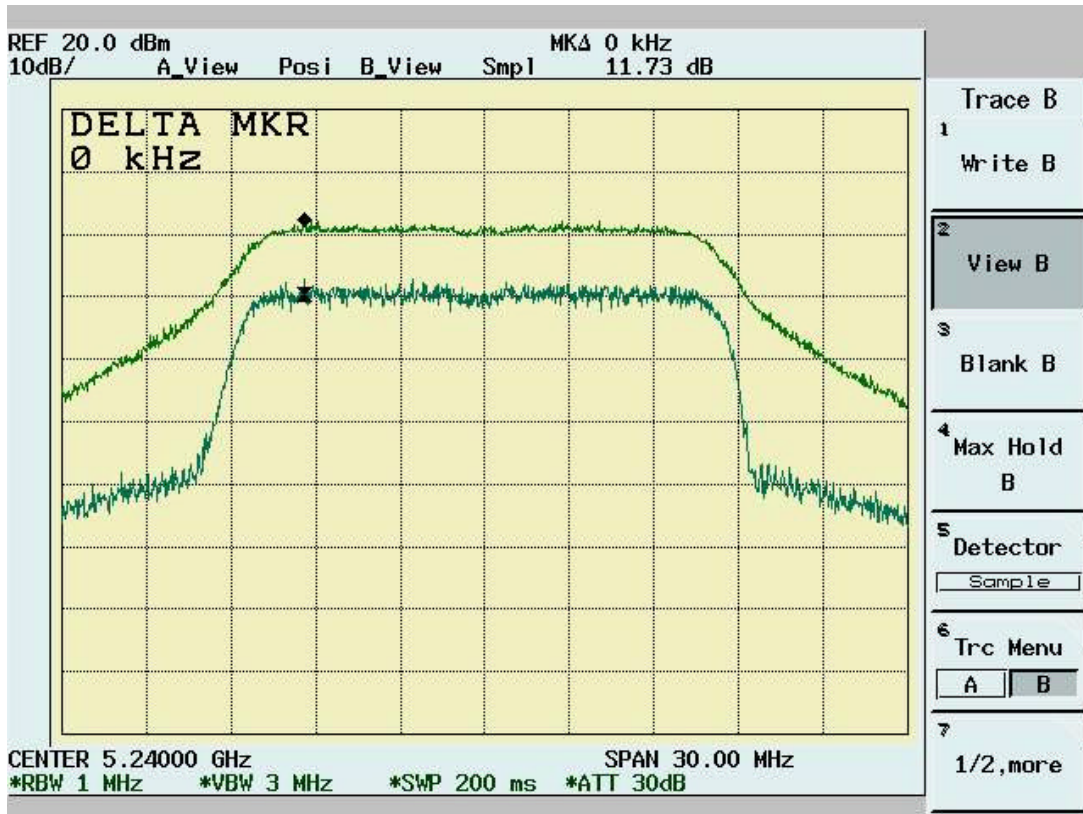
**4.3.4 Test Data: (Turbo Mode)****Peak Power Excursion**

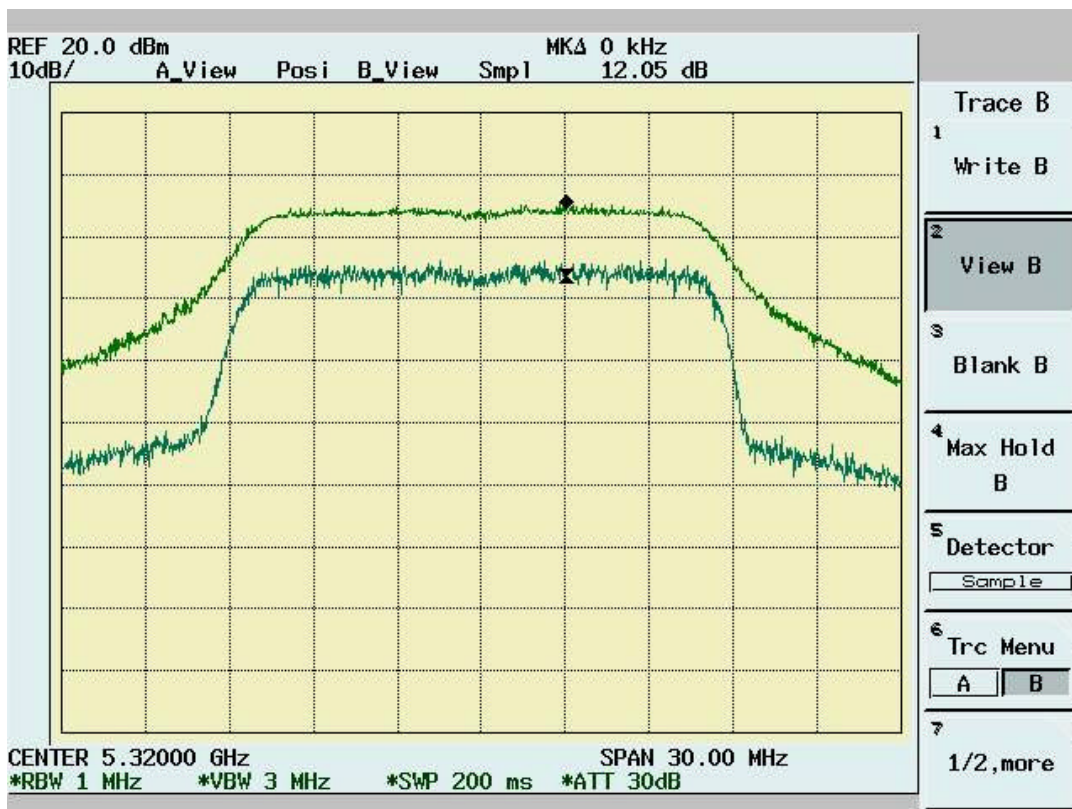
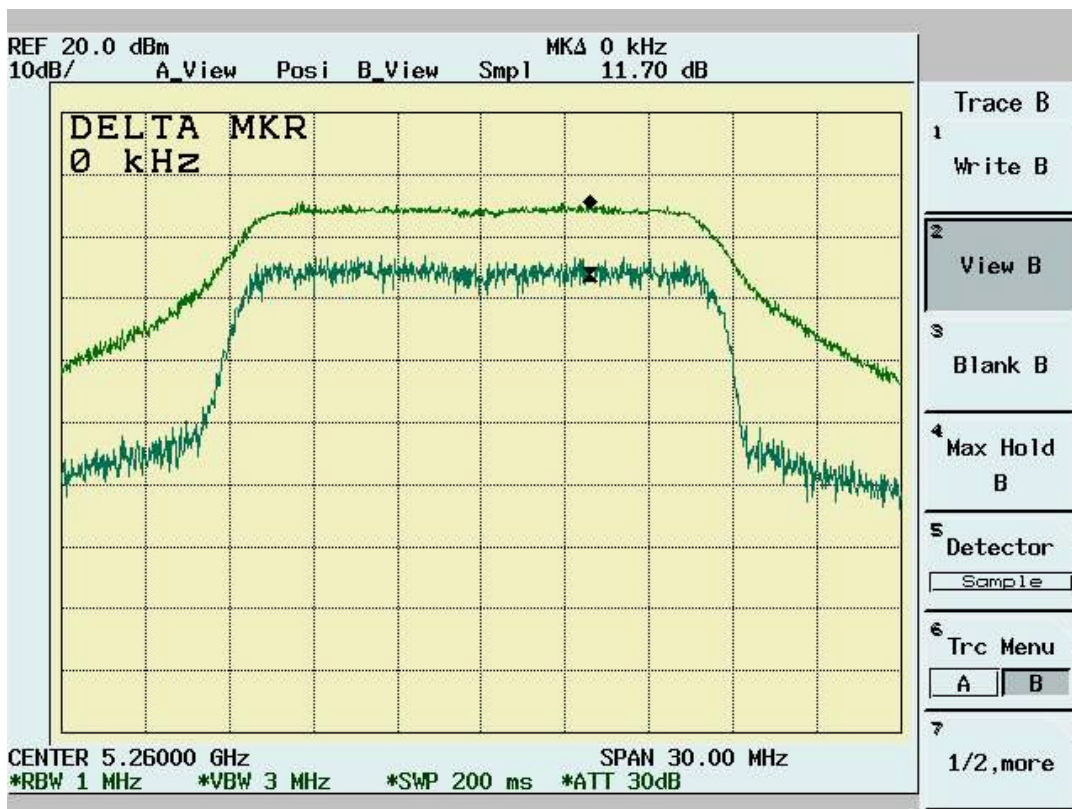
Temp. (deg. C): 25

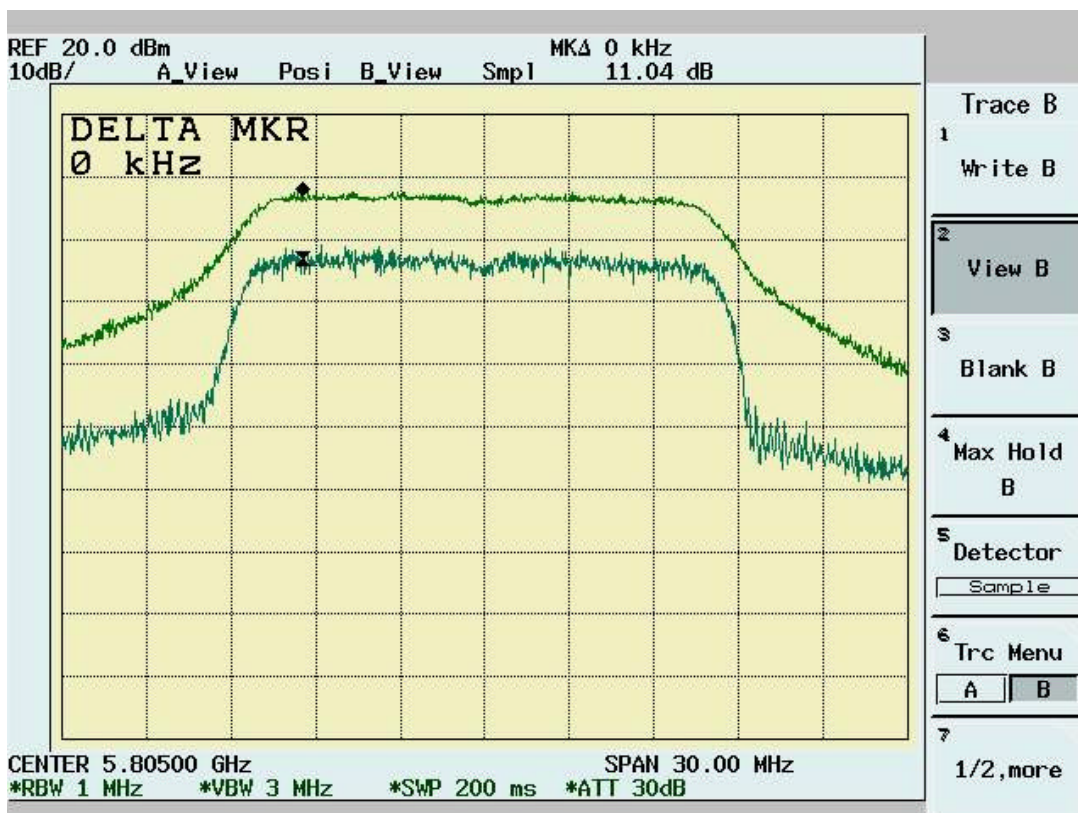
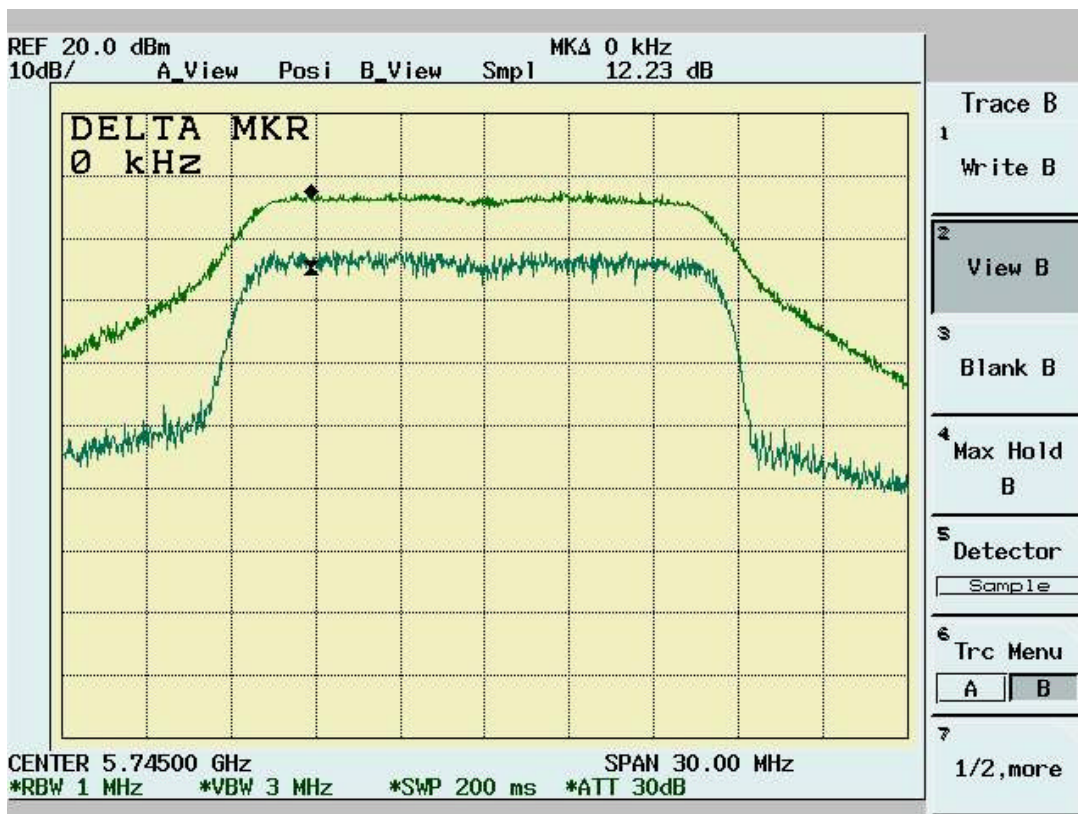
Test Engr: Mailes Hsieh

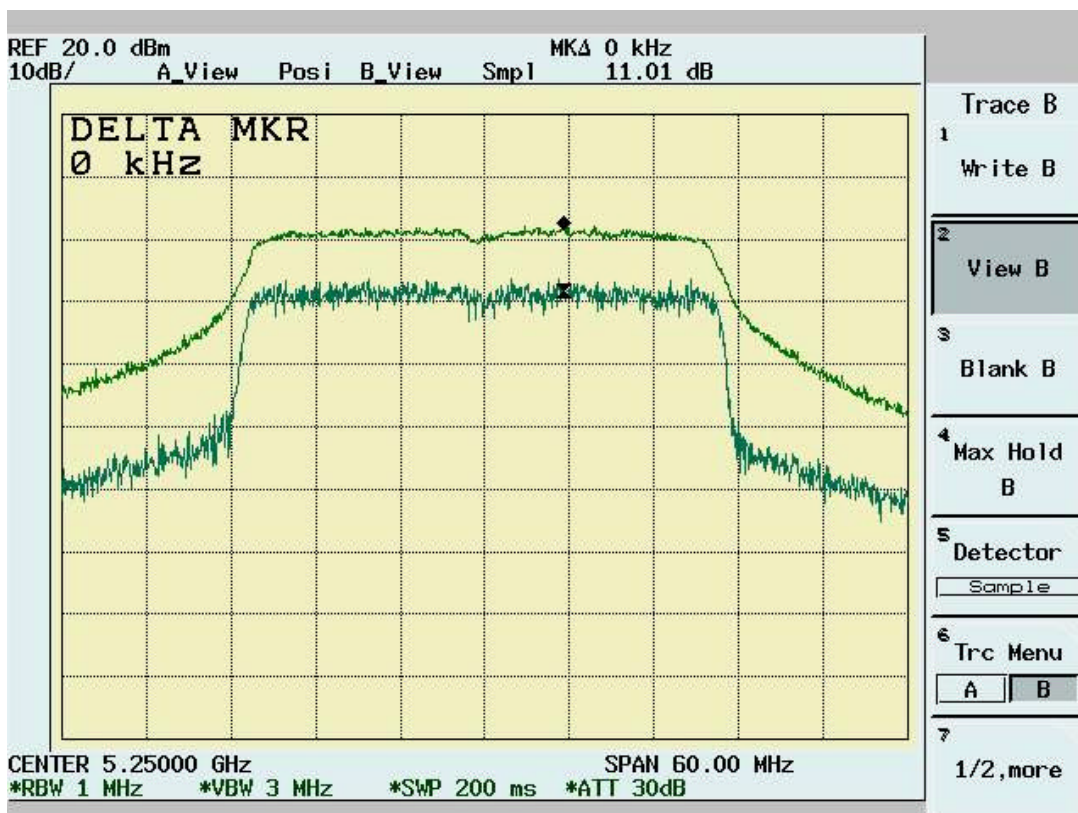
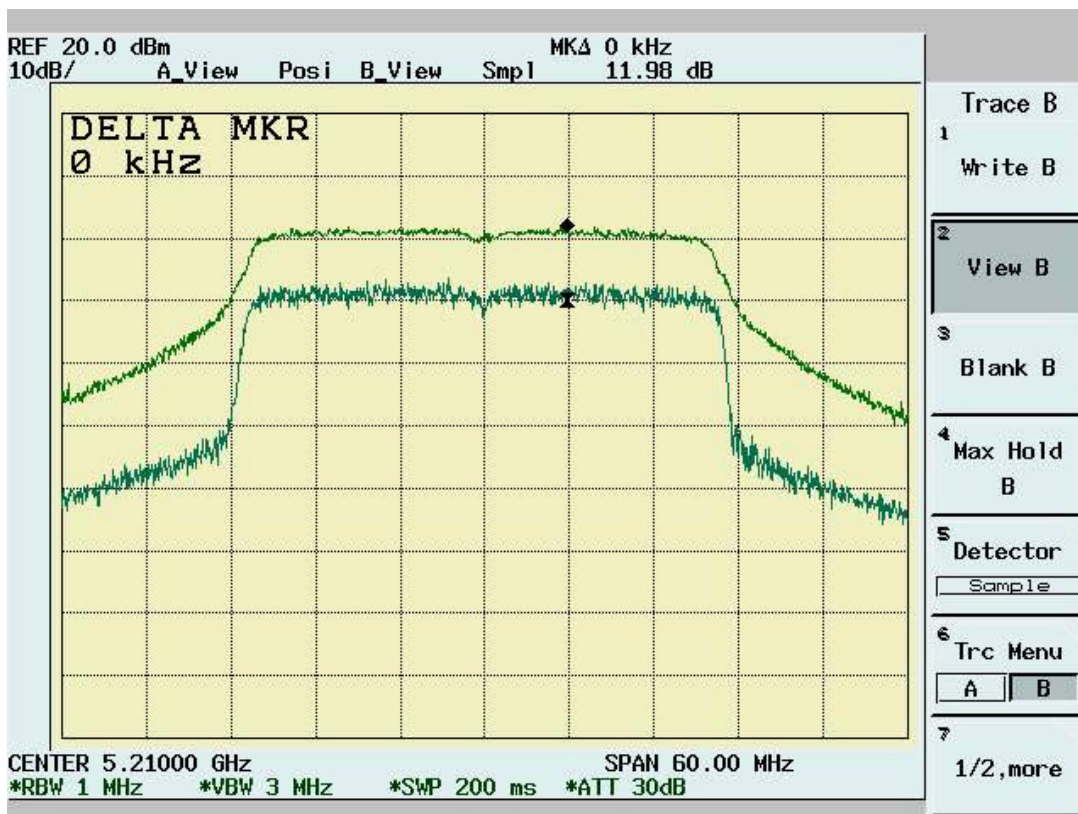
Humidity (%): 50

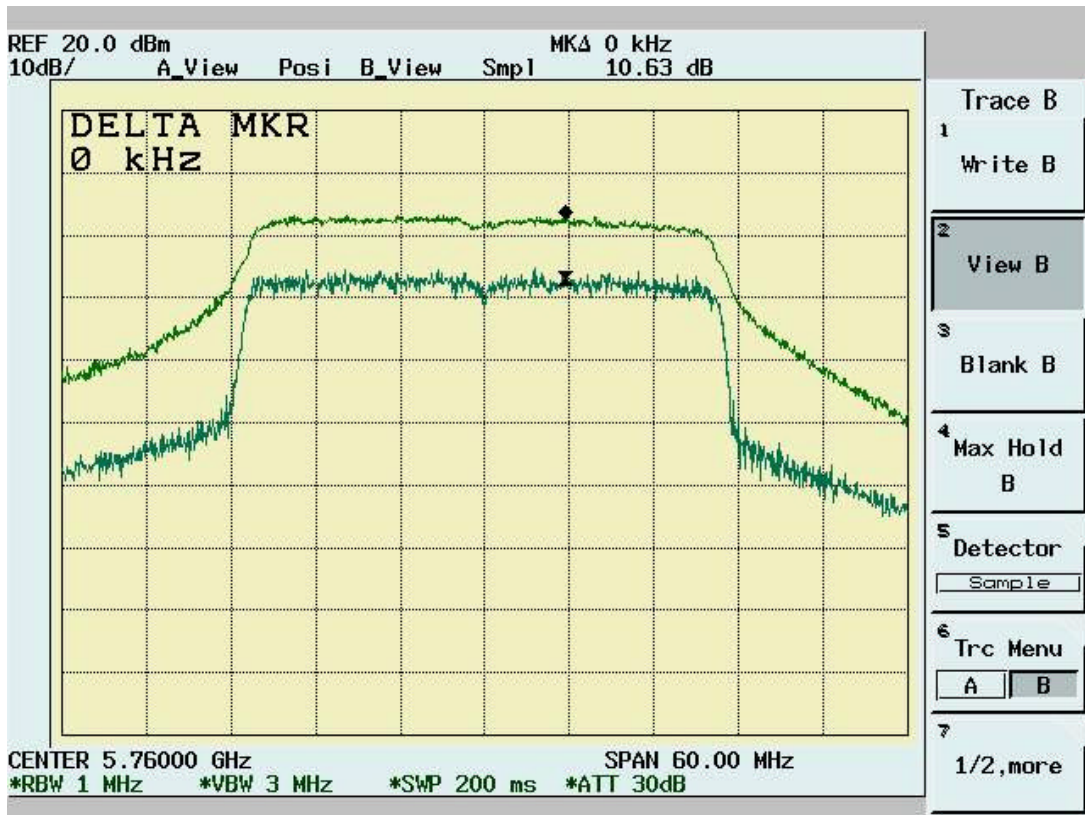
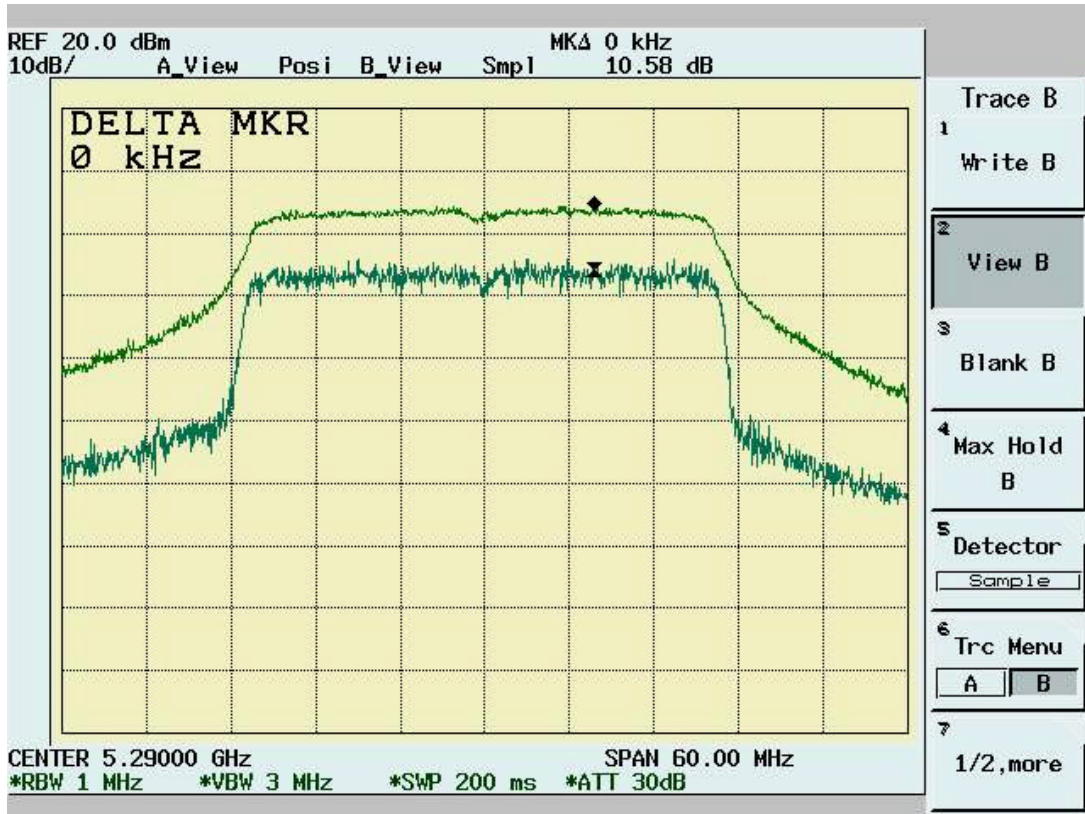
| Channel | Frequency (Mhz) | Peak Power Excursion (dBm) | Limit dBm | Pass/Fail |
|---------|-----------------|----------------------------|-----------|-----------|
| 1       | 5210            | 11.98                      | 13        | Pass      |
| 2       | 5250            | 11.01                      | 13        | Pass      |
| 3       | 5290            | 10.58                      | 13        | Pass      |
| 4       | 5760            | 10.63                      | 13        | Pass      |
| 5       | 5800            | 11.86                      | 13        | Pass      |

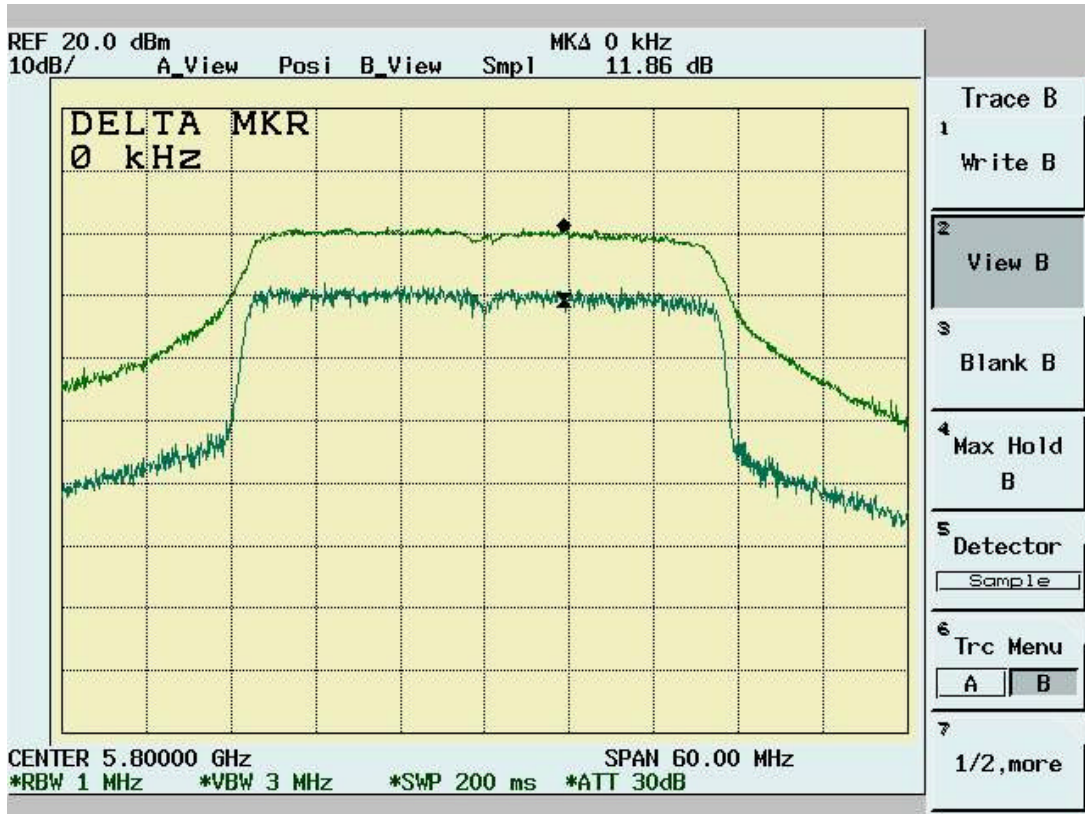












## **4.4 Powerline Conducted Emissions [Section 15.207 & 15.407 (b)(5) ]**

### **4.4.1 EUT Configuration**

The EUT was set up on the non-conductive table that is 1.0 by 1.5 meter, 80cm above ground. The wall of the shielded room was located 40cm to the rear of the EUT.

Power to the EUT was provided through the LISN. The impedance vs. frequency characteristic of the LISN is complied with the limit shown on the figure 1 of ANSI C63.4-2001.

Both lines (neutral and hot) were connected to the LISN in series at testing. A coaxial-type connector which provides one 50 ohms terminating impedance was provided for connecting the test instrument. The excess length of the power cord was folded back and forth at the center of the lead so as to form a bundle not exceeding 40cm in length.

Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.

If the EUT is a Personal Computer or a peripheral of personal computer, and the personal computer has an auxiliary AC outlet which can be used for providing power to an external monitor, then all measurements will be made with the monitor power from first the computer-mounted AC outlet and then a floor-mounted AC outlet.

### **4.4.2 Test Procedure**

The system was set up as described above, with the EMI diagnostic software running. The main power line conducted EMI tests were run on the hot and neutral conductors of the power cord and the results were recorded. The effect of varying the position of the interface cables has been investigated to find the configuration that produces maximum emission.

At the frequencies where the peak values of the emissions were higher than 6dB below the applicable limits, the emissions were also measured with the quasi-peak detectors. At the frequencies where the quasi-peak values of the emissions were higher than 6dB below the applicable average limits, the emissions were also measured with the average detectors.

The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information which could be useful in reducing their amplitude.

### **4.4.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)**

|                    |                    |
|--------------------|--------------------|
| Frequency Range:   | 150 KHz--30MHz     |
| Detector Function: | Quasi-Peak/Average |
| Bandwidth (RBW):   | 9KHz               |

## 4.4.4 Test Data:

## Power Line Conducted Emissions (Hot)

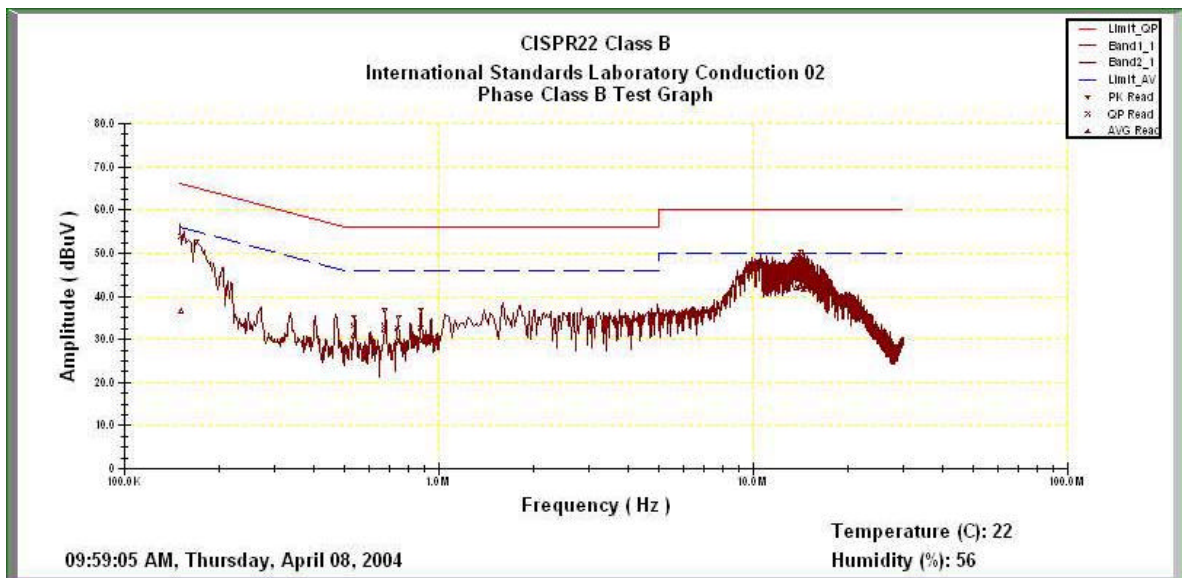
Operator: Mailes Hsieh

Temperature (C): 22

Humidity (%): 56

09:59:05 AM, Thursday, April 08, 2004

| Frequency | LISN Loss | Cable Loss | QP Corrct. | QP Limit | QP Margin | AVE Corrct. | AVE Limit | AVE Margin |
|-----------|-----------|------------|------------|----------|-----------|-------------|-----------|------------|
| MHz       | (dB)      | (dB)       | Amp.(dBuV) | (dBuV)   | (dB)      | Amp.(dBuV)  | (dBuV)    | (dB)       |
| 0.1508    | 0.10      | 0.02       | 53.93      | 65.98    | -12.05    | 36.56       | 55.98     | -19.42     |
| 0.53551   | 0.12      | 0.03       | 33.22      | 56.00    | -22.78    | 30.90       | 46.00     | -15.10     |
| 0.66915   | 0.14      | 0.04       | 33.12      | 56.00    | -22.88    | 31.95       | 46.00     | -14.05     |
| 0.73568   | 0.16      | 0.05       | 32.59      | 56.00    | -23.41    | 29.86       | 46.00     | -16.14     |
| 0.87393   | 0.18      | 0.06       | 32.63      | 56.00    | -23.37    | 29.75       | 46.00     | -16.25     |
| 13.6684   | 0.65      | 0.27       | 47.11      | 60.00    | -12.89    | 41.91       | 50.00     | -8.09      |
| 13.8672   | 0.66      | 0.27       | 47.59      | 60.00    | -12.41    | 42.17       | 50.00     | -7.83      |
| 14.135    | 0.67      | 0.28       | 47.48      | 60.00    | -12.52    | 42.13       | 50.00     | -7.87      |
| 14.1998   | 0.67      | 0.28       | 47.70      | 60.00    | -12.30    | 42.30       | 50.00     | -7.70      |
| 14.4688   | 0.68      | 0.29       | 46.39      | 60.00    | -13.61    | 41.46       | 50.00     | -8.54      |



**Power Line Conducted Emissions (Neutral)**

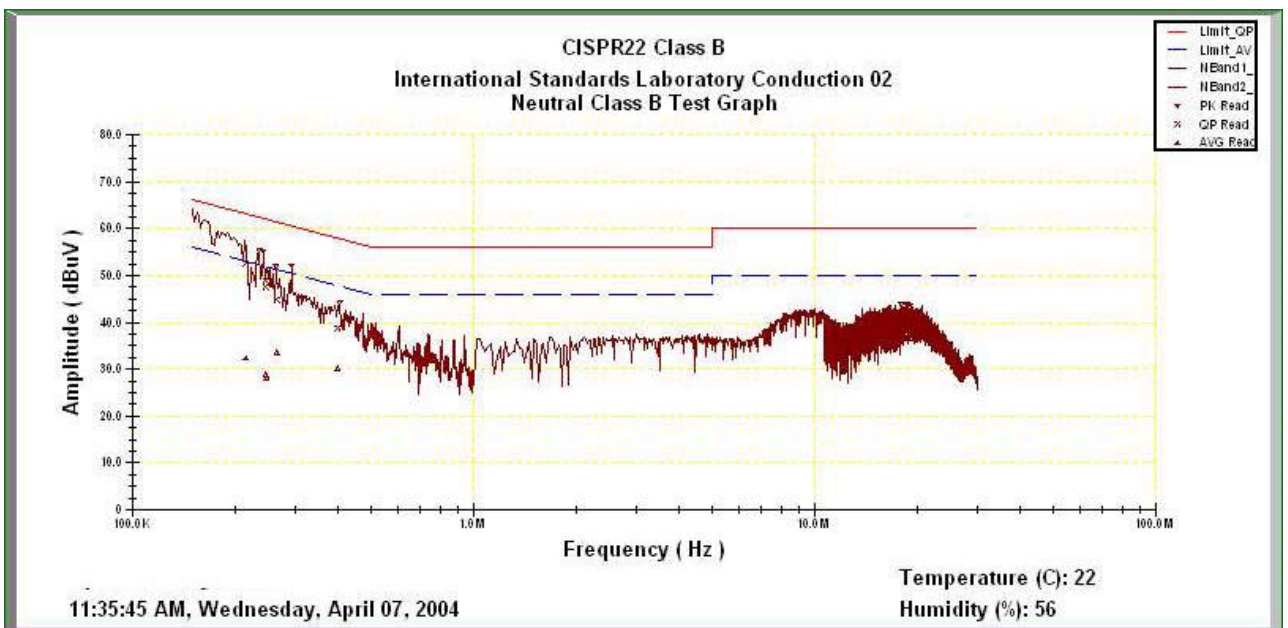
Operator: Mailes Hsieh

Temperature (C): 22

11:35:45 AM, Wednesday, April 07, 2004

Humidity (%): 56

| Frequency | LISN Loss | Cable Loss | QP Corrt.    | QP Limit | QP Margin | AVE Corrt.   | AVE Limit | AVE Margin |
|-----------|-----------|------------|--------------|----------|-----------|--------------|-----------|------------|
| MHz       | (dB)      | (dB)       | Amp.(dBuV)   | (dBuV)   | (dB)      | Amp.(dBuV)   | (dBuV)    | (dB)       |
| 0.21491   | 0.10      | 0.02       | 52.58        | 64.15    | -11.57    | 32.33        | 54.15     | -21.81     |
| 0.24515   | 0.10      | 0.02       | 48.89        | 63.28    | -14.39    | 28.78        | 53.28     | -24.50     |
| 0.24625   | 0.10      | 0.02       | 47.46        | 63.25    | -15.79    | 28.09        | 53.25     | -25.16     |
| 0.26493   | 0.10      | 0.02       | 44.88        | 62.72    | -17.84    | 33.61        | 52.72     | -19.11     |
| 0.39818   | 0.10      | 0.02       | 38.72        | 58.91    | -20.18    | 30.20        | 48.91     | -18.70     |
| 17.9458   | 0.46      | 0.28       | 40.33        | 60.00    | -19.67    | 35.98        | 50.00     | -14.02     |
| 18.4834   | 0.47      | 0.27       | 41.39        | 60.00    | -18.61    | 37.52        | 50.00     | -12.48     |
| 18.6165   | 0.47      | 0.27       | 41.39        | 60.00    | -18.61    | 37.48        | 50.00     | -12.52     |
| 18.6831   | 0.47      | 0.27       | 41.38        | 60.00    | -18.62    | 37.32        | 50.00     | -12.68     |
| 19.1486   | 0.48      | 0.27       | 41.32        | 60.00    | -18.68    | 36.52        | 50.00     | -13.48     |
| MHz       | (dB)      | (dB)       | Amp . (dBuV) | (dBuV)   | (dB)      | Amp . (dBuV) | (dBuV)    | (dB)       |
| 0.21491   | 0.10      | 0.02       | 52.58        | 64.15    | -11.57    | 32.33        | 54.15     | -21.81     |



\* NOTE: During the test, the EMI receiver was set to Max. Hold then switch the EUT between Main antenna , Aux antenna Channel 1 , 4, 5, 8, 9, 12 of Normal Mode and Channel 1, 2, 3, 4, 5 of Turbo Mode to get the maximum reading of all these channels.  
Margin = Amplitude + Insertion Loss- Limit  
A margin of -8dB means that the emission is 8dB below the limit

## 4.5 Radiated Emission Measurement [Section 15.209 & 15.407(b)(5)]

### 4.5.1 EUT Configuration

The equipment under test was set up on the 10 meter chamber with measurement distance of 3 meters. The EUT was placed on a non-conductive table 80cm above ground.

Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.

### 4.5.2 Test Procedure

The system was set up as described above, with the EMI diagnostic software running. We found the maximum readings by varying the height of antenna and then rotating the turntable. Both polarization of antenna, horizontal and vertical, are measured.

30M to 1GHz: The highest emissions between 30 MHz to 1000 MHz were also analyzed in details by operating the spectrum analyzer and/or EMI receiver in quasi-peak mode to determine the precise amplitude of the emissions. While doing so, the interconnecting cables and major parts of the system were moved around, the antenna height was varied between one and four meters, its polarization was varied between vertical and horizontal, and the turntable was slowly rotated, to maximize the emission.

1GHz – 40GHz: The highest emissions were also analyzed in details by operating the spectrum analyzer and/or EMI receiver in peak mode to determine the precise amplitude of the emission. While doing so, the interconnecting cables and major parts of the system were moved around, the antenna height was varied between one and four meters, its polarization was varied between vertical and horizontal, and the turntable was slowly rotated, to maximize the emission. During test the EMI receiver and spectrum was setup according to para. 6.5.3.

For the test of 2<sup>nd</sup> to 10<sup>th</sup> harmonics frequencies, the equipment setup was also refer to para.6.5.3. The frequencies were tested using Peak mode first, if the test data is higher than the emissions limit, an additional measurement using Average mode will be performed and the average reading will be compared to the limit and record in test report.

### 4.5.3 EMI Receiver/Spectrum Analyzer Configuration

|                             |                 |
|-----------------------------|-----------------|
| Frequency Range Tested:     | 30MHz~1000MHz   |
| Detector Function:          | Quasi-Peak Mode |
| Resolution Bandwidth (RBW): | 120KHz          |
| Video Bandwidth (VBW)       | 1MHz            |
| Frequency Range Tested:     | 1GHz – 40 GHz   |
| Detector Function:          | Peak Mode       |
| Resolution Bandwidth (RBW): | 1MHz            |
| Video Bandwidth (VBW)       | 1MHz            |
| Frequency Range Tested:     | 30MHz – 40 GHz  |
| Detector Function:          | Average Mode    |
| Resolution Bandwidth (RBW): | 1MHz            |
| Video Bandwidth (VBW)       | 10 Hz           |

#### 4.5.4 Test Data (30MHz – 1GHz) .

##### 30M – 1GHz Open Field Radiated Emissions (Horizontal)

Operator: Mailes Hsieh

Humidity (%): 46

Temperature (C): 25

| Frequency | Rx_R  | Ant_F | Cab_L | PreAmpl | Emission | Limit  | Margin | A.Tower | T.Table |
|-----------|-------|-------|-------|---------|----------|--------|--------|---------|---------|
| MHz       | dBuV  | dB/m  | dB    | dB      | dBuV/m   | dBuV/m | dB     | cm      | deg     |
| 99.84     | 22.05 | 10.27 | 3.02  | 0.00    | 35.33    | 43.50  | -8.17  | 200.00  | 200.00  |
| 198.78    | 25.06 | 8.86  | 4.18  | 0.00    | 38.10    | 43.50  | -5.40  | 200.00  | 7.00    |
| 232.73    | 27.45 | 9.33  | 4.50  | 0.00    | 41.28    | 46.00  | -4.72  | 100.00  | 65.00   |
| 298.69    | 21.75 | 13.57 | 4.69  | 0.00    | 40.02    | 46.00  | -5.98  | 150.00  | 219.00  |
| 398.6     | 21.52 | 15.95 | 5.31  | 0.00    | 42.79    | 46.00  | -3.21  | 100.00  | 303.00  |
| 431.58    | 19.00 | 16.25 | 5.61  | 0.00    | 40.86    | 46.00  | -5.14  | 100.00  | 237.00  |
| 464.56    | 15.20 | 16.78 | 5.87  | 0.00    | 37.85    | 46.00  | -8.15  | 100.00  | 65.00   |
| 497.54    | 18.69 | 17.64 | 6.04  | 0.00    | 42.36    | 46.00  | -3.64  | 150.00  | 254.00  |
| 563.5     | 13.17 | 19.05 | 6.56  | 0.00    | 38.78    | 46.00  | -7.22  | 100.00  | 161.00  |
| 864.2     | 7.29  | 20.54 | 8.24  | 0.00    | 36.07    | 46.00  | -9.93  | 100.00  | 181.00  |

##### 30M – 1GHz Open Field Radiated Emissions (Vertical)

Operator: Mailes Hsieh

Humidity (%): 46

Temperature (C): 25

| Frequency | Rx_R  | Ant_F | Cab_L | PreAmpl | Emission | Limit  | Margin | A.Tower | T.Table |
|-----------|-------|-------|-------|---------|----------|--------|--------|---------|---------|
| MHz       | dBuV  | dB/m  | dB    | dB      | dBuV/m   | dBuV/m | dB     | cm      | deg     |
| 138.64    | 18.12 | 10.54 | 3.55  | 0.00    | 32.21    | 43.50  | -11.29 | 200.00  | 330.00  |
| 231.76    | 21.00 | 9.21  | 4.48  | 0.00    | 34.70    | 46.00  | -11.30 | 100.00  | 298.00  |
| 364.65    | 14.87 | 14.80 | 5.07  | 0.00    | 34.73    | 46.00  | -11.27 | 150.00  | 223.00  |
| 431.58    | 13.17 | 16.25 | 5.61  | 0.00    | 35.03    | 46.00  | -10.97 | 100.00  | 260.00  |
| 497.54    | 13.12 | 17.64 | 6.04  | 0.00    | 36.80    | 46.00  | -9.20  | 100.00  | 346.00  |
| 643.04    | 8.42  | 19.07 | 7.00  | 0.00    | 34.50    | 46.00  | -11.50 | 250.00  | 280.00  |
| 651.77    | 14.02 | 19.10 | 7.04  | 0.00    | 40.16    | 46.00  | -5.84  | 100.00  | 266.00  |
| 661.47    | 9.30  | 19.08 | 7.07  | 0.00    | 35.45    | 46.00  | -10.55 | 150.00  | 297.00  |
| 815.7     | 8.72  | 20.19 | 7.93  | 0.00    | 36.83    | 46.00  | -9.17  | 100.00  | 96.00   |
| 866.14    | 6.48  | 20.54 | 8.26  | 0.00    | 35.28    | 46.00  | -10.72 | 100.00  | 41.00   |

\* NOTE: During the pre-test, the EUT has been tested for Channel 1, 4, 5, 8, 9, 12 of Normal Mode and Channel 1, 2, 3, 4, 5 of Turbo mode and transmit from Main and Aux antenna respectively to get all the critical emission frequencies. In the final test all the critical emission frequencies has been tested and the test data are listed above.

Margin=Corrected Amplitude–Limit

Corrected Amplitude = Radiated Amplitude + Antenna Correction Factor + Cable Loss - Pre-Amplifier Gain

A margin of -8dB means that the emission is 8dB below the limit

**All frequencies from 30MHz to 1GHz have been tested**

#### 4.5.5 Test Data ( 1GHz – 40 GHz, Transmitting ).

##### 1GHz~ 40 GHz (Horizontal), Normal Mode, Channel 1 : 5180 MHz

Operator: Mailes Hsieh

 RBW: 1 MHz  
 Humidity (%): 46  
 Temperature (C): 25

| Frequency | Rx_R  | Ant_F | Cab_L | PreAmpl | Emission | Limit  | Margin | A.Tower | T.Table |
|-----------|-------|-------|-------|---------|----------|--------|--------|---------|---------|
| MHz       | dBuV  | dB/m  | dB    | dB      | dBuV/m   | dBuV/m | dB     | cm      | deg     |
| 4074.93   | 51.13 | 32.21 | 1.71  | 46.18   | 38.87    | 54.00  | -15.13 | 102     | 174     |
| 4592.81   | 50.88 | 33.79 | 1.88  | 46.68   | 39.87    | 54.00  | -14.13 | 102     | 95      |
| 8171.23   | 45.11 | 41.13 | 2.53  | 43.31   | 45.46    | 54.00  | -8.54  | 100     | 62      |
| 10025.9   | 39.27 | 39.21 | 2.83  | 41.12   | 40.18    | 54.00  | -13.82 | 101     | 169     |
| 11744.1   | 39.47 | 42.25 | 3.06  | 42.15   | 42.63    | 54.00  | -11.37 | 100     | 347     |
| 15537.8   | 40.66 | 42.92 | 5.38  | 42.66   | 46.30    | 54.00  | -7.70  | 101     | 259     |

##### 1GHz~ 40 GHz (Vertical), Normal Mode, Channel 1: 5180 MHz

Operator: Mailes Hsieh

 RBW: 1 MHz  
 Humidity (%): 46  
 Temperature (C): 25

| Frequency | Rx_R  | Ant_F | Cab_L | PreAmpl | Emission | Limit  | Margin | A.Tower | T.Table |
|-----------|-------|-------|-------|---------|----------|--------|--------|---------|---------|
| MHz       | dBuV  | dB/m  | dB    | dB      | dBuV/m   | dBuV/m | dB     | cm      | deg     |
| 1877.52   | 59.03 | 29.70 | 0.97  | 46.20   | 43.49    | 54.00  | -10.51 | 101     | 65      |
| 2391.81   | 54.44 | 30.54 | 1.14  | 46.21   | 39.92    | 54.00  | -14.08 | 101     | 50      |
| 7246.95   | 45.10 | 39.70 | 2.36  | 46.20   | 40.97    | 54.00  | -13.03 | 101     | 45      |
| 8088.51   | 45.39 | 41.16 | 2.51  | 43.52   | 45.55    | 54.00  | -8.45  | 101     | 172     |
| 10985.3   | 39.13 | 40.47 | 2.96  | 40.52   | 42.04    | 54.00  | -11.96 | 100     | 309     |
| 15542.7   | 42.45 | 42.94 | 5.39  | 42.65   | 48.13    | 54.00  | -5.87  | 102     | 157     |

Note: “ \* ”: Fundamental Frequency

“ pk ”: peak reading

“ av ”: average reading

The Spectrum noise level+Correction Factor&lt;Limit-6 dB

Margin = Corrected Amplitude – Limit

Corrected Amplitude=Radiated Amplitude+Antenna Correction Factor+Cable Loss-Pre-Amplifier Gain

A margin of -8dB means that the emission is 8dB below the limit.

**The restricted band limit is 54dBuV, the out of band limit is 68.3dBuV. All test data can meet this both limit.**

$$(E = \frac{1000000 \sqrt{30P}}{3} \text{ mV} / \text{m}, -27\text{dBm EIRP} = 68.3 \text{ dBuV})$$

**All frequencies from 1GHz to 40 GHz have been tested.**

**1GHz~ 40 GHz (Horizontal), Normal Mode, Channel 4: 5240 MHz**

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

| Frequency | Rx_R  | Ant_F | Cab_L | PreAmpl | Emission | Limit  | Margin | A.Tower | T.Table |
|-----------|-------|-------|-------|---------|----------|--------|--------|---------|---------|
| MHz       | dBuV  | dB/m  | dB    | dB      | dBuV/m   | dBuV/m | dB     | cm      | deg     |
| 3686.51   | 51.23 | 31.62 | 1.58  | 46.45   | 37.99    | 54.00  | -16.01 | 102     | 181     |
| 4064.14   | 51.89 | 32.18 | 1.70  | 46.17   | 39.6     | 54.00  | -14.40 | 102     | 100     |
| 4434.57   | 51.80 | 33.22 | 1.83  | 46.54   | 40.31    | 54.00  | -13.69 | 101     | 45      |
| 8034.57   | 45.84 | 41.19 | 2.51  | 43.66   | 45.87    | 54.00  | -8.13  | 100     | 205     |
| 11435.7   | 38.29 | 42.16 | 3.02  | 41.45   | 42.01    | 54.00  | -11.99 | 102     | 184     |
| 15714.0   | 37.55 | 43.48 | 5.64  | 42.08   | 44.59    | 54.00  | -9.41  | 102     | 71      |

**1GHz~ 40 GHz (Vertical), Normal Mode, Channel 4: 5240 MHz**

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

| Frequency | Rx_R  | Ant_F | Cab_L | PreAmpl | Emission | Limit  | Margin | A.Tower | T.Table |
|-----------|-------|-------|-------|---------|----------|--------|--------|---------|---------|
| MHz       | dBuV  | dB/m  | dB    | dB      | dBuV/m   | dBuV/m | dB     | cm      | deg     |
| 2122.08   | 56.65 | 30.65 | 1.05  | 46.20   | 42.15    | 54.00  | -11.85 | 103     | 247     |
| 4118.08   | 50.95 | 32.33 | 1.72  | 46.23   | 38.78    | 54.00  | -15.22 | 102     | 129     |
| 4574.83   | 51.23 | 33.71 | 1.88  | 46.67   | 40.15    | 54.00  | -13.85 | 102     | 82      |
| 8146.05   | 45.77 | 41.14 | 2.53  | 43.38   | 46.06    | 54.00  | -7.94  | 101     | 55      |
| 11690.2   | 40.12 | 42.29 | 3.05  | 42.03   | 43.43    | 54.00  | -10.57 | 102     | 315     |
| 16707.7   | 37.23 | 45.18 | 6.31  | 42.12   | 46.61    | 54.00  | -7.39  | 102     | 170     |

Note: “ \* ”: Fundamental Frequency

“ pk ”: peak reading

“ av ”: average reading

The Spectrum noise level+Correction Factor&lt;Limit-6 dB

Margin = Corrected Amplitude – Limit

Corrected Amplitude=Radiated Amplitude+Antenna Correction Factor+Cable Loss-Pre-Amplifier Gain

A margin of -8dB means that the emission is 8dB below the limit.

**The restricted band limit is 54dBuV, the out of band limit is 68.3dBuV. All test data can meet this both limit.**

$$(E = \frac{1000000\sqrt{30P}}{3} \text{ mV} / \text{m}, -27\text{dBm EIRP} = 68.3 \text{ dBuV})$$

**All frequencies from 1GHz to 40 GHz have been tested.**